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ABSTRACT

This paper is a critical review of Eleanor Orr's theory that African American students have difficulty with mathematical and scientific concepts because they speak Black English. Orr's data are criticized on many levels. For instance, her facts are derived from a limited subject pool and she has failed to take into account other possible reasons why African American students might have trouble understanding mathematical concepts. Poor teaching methods and lack of reading ability in the elementary grades may have more to do with low mathematics comprehension than Black English usage. African American students are not the only students who have difficulty with math; whites and other minorities score low as well. In addition, not all African American students have difficulties. Recommendations are made for improving teaching methods rather than correcting the Black English of African American students. (JS)

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Essays and Policy Studies

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Look at Math Teachers, Not "Black English"

J. Arthur Jones

A REVIEW AND RECOMMENDATIONS, based on *Twice As Less: Black English and the Performance of Black Students in Mathematics and Science*, by Eleanor Wilson Orr (New York: W. W. Norton & Company, 1987)

The performance of African-American students in mathematics and science is crippled by the use of "Black English," says Eleanor Orr. "To me, it is clear that the perceptions these students have of certain qualitative comparisons are shaped by the language they use," she explains. This is a serious cultural allegation against large numbers of African-American children.

As one who has been a mathematician for many years, teaching African-Americans from all socioeconomic groups and at elementary, secondary and university levels throughout the country, I can assure you that Orr's conclusion simply is not true. Her study, in fact, raises several other questions for us to examine.

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For example, has Orr overplayed the role of language in learning mathematics and science? What are the real causes of academic underachievement in mathematics and science by African-American students? How can we improve the achievement of African-American students in mathematics and science?

Language and Academic Underachievement

Orr attempts to show a connection between the thinking processes of her students and their use of the so-called "Black English vernacular." To do this, she gives numerous examples of how some of her African-American students responded to certain problems in mathematics.

Unfortunately, her study of linguistic interference is based on a limited sample of students attending one high school in Washington, D.C., but she generalizes her conclusions as if they apply to African-American students nationwide.

One of her students, Jane, confused the concepts of location and distance. Orr claims this is because Jane used a single symbol, a straight line segment, to represent both location and distance. Generally, location would be represented by a point, and distance would be represented by a line segment.

Orr does not say whether Jane's problem occurred among other African-American students at her school. What would Orr have concluded if one of her students who used "Black English" had a correct understanding of location and distance and had drawn the "proper" diagram? It may be that Jane's difficulties stemmed from her own shortcomings in perception and not from the use of "Black English." Unfortunately, the reader is left with the suggestion that "Black English" is the culprit.

Concepts in mathematics and science can be communicated and explained with many tools: the written or spoken word, pictures, diagrams, special symbols, manipulative materials, or a combination of these. If a student fails to understand a mathematical concept, the first place to look for the reason is in the teacher's use of one of these tools of communication.

Moreover, students have a variety of learning styles that influence the difficulty or ease with which they understand certain concepts. Some students learn more easily with some of these communication tools than with others.

Teaching reading comprehension is important for word problems, but it certainly is not the only way to train students how to interpret or solve problems in mathematics and science. Orr focuses her attention almost entirely on the written and spoken word, ignoring other significant methods for transferring knowledge and clarifying perceptions. In fact, the effects of "improper" language usage may be offset by the use of appropriate pictures, diagrams or manipulative materials, but Orr does not mention these possibilities.

Orr's geometry example reflects a defect in teaching geometry, rather than a defect in the language of the learner. She faults her student, Mary, for not using the linear approach, which would have required Mary to place statements and reasons in numbered lines.

However, this method actually may hinder some students as they formulate logical reasons for geometric proofs, because human reasoning generally is not a linear process. It is recursive, connecting what is given to what is to be proved, and it only appears to be linear after a solution has been found.

The fallacious reasoning attributed to Mary is something I have found among many students who are not African Americans or even remotely involved with "Black English." In fact, Mary's problems may have resulted from her lack of understanding and limited experience in actually "thinking through" a proof, rather than merely writing statements and reasons in horizontal lines.

Another difficulty in teaching mathematics lies in the texts and materials that are used, especially in the earlier years of a student's career. Most of these materials concentrate almost entirely on numerical computations. Words and numbers are rarely combined for the purpose of logical reasoning and solving problems. In most instances, the elementary school mathematics curriculum is almost totally devoid of "word problems." Rarely is a student asked to do more than "add this," "subtract this," "multiply this," or "divide this."

Orr's African-American students suffered more from a lack of experience with word problems than from their use of "Black English."

Orr fails to acknowledge that the difficulties of many students are shaped by the quality of earlier teaching, materials, teacher expectations, learning experiences, learning styles, interests and motivation. It could be argued that the usage of any particular language has a minor, if any, role in mathematical perception, because concepts can be expressed correctly in any language.

There is no doubt that students who have severe language and reading problems will have difficulty in interpreting and solving certain problems, but this affects students from all language backgrounds. The African-American students in Orr's school apparently lacked challenging learning experiences in prior mathematics instruction. For example, they may have had few opportunities in their early years to solve mathematical problems in a manner that tied mathematical concepts to the written word.

These reading problems among Orr's students may have contributed more heavily to their inability to solve certain mathematical problems than their usage of "Black English." Can she prove otherwise? Her book ignores these types of difficulties. She has very little to say about the roles of teaching and motivating in the learning process. Instead, she tends to place the blame on her students' use of language.

Orr cites the activity of making comparisons as another example of linguistic interference among her African-American students. For example, she claims that these students, in their oral and written communication, were unable to use correctly comparative expressions like "as...as" and "as...then." Orr's discussion of this area represents a rather limited treatise on "Black English." She implies that its users have difficulties in logical reasoning involving words such as all, some or none. However, she provides only speculation, rather than evidence, that "Black English" is the culprit.

As an African American who grew up in the South during the 1940s and 1950s, a period when formal education for African Americans was much more limited than it is today, I can recall no instance where the type of language problems mentioned by Orr had a negative impact on perception and problem solving in mathematics. Nor have I ever heard any student use the term "twice as less," which is the title of Orr's book.

There are many African-American students who grew up hearing and using "Black English" but who, nevertheless, excelled in mathematics and science throughout their school careers. How would Orr explain this difference?

She offers many detailed examples to justify her accusations of shortcomings among her students, but hardly any to describe the teaching methods that were used at her school to help students overcome their difficulties. Her limited sample, which she describes anecdotally, does not provide a basis for a sweeping indictment.

Orr's book is replete with numerous examples of how her African-American students had difficulties with problems involving **distance**, **rate** and **time**. Orr attributed their difficulties primarily to their use of "Black English." However, in my experience as a mathematics teacher, I have found many White students who have difficulties with these types of problems. An examination of scores on the mathematics portion of the Scholastic Aptitude Test for any year will reveal that students across the nation generally are not very good at solving problems involving distance, rate and time.

In my work with students I have been able to oversome some of their difficulties in this area by emphasizing the relationship between distance, rate and time, as follows: distance (d) equals rate (r) multiplied by time (t), or $d=rt$. I also would emphasize the following equivalent relationships: $r=d/t$ and $t=d/r$

Using this approach in teaching problem solving to African-American students, I encounter none of the problems described by Orr. My students were given many examples and problems that highlighted the relationships among distance, rate and time, and this experience significantly enhanced their knowledge and skills in problem solving.

Orr attributes the problem-solving difficulties of African Americans who use the vernacular to poor language skills, but I would attribute such difficulties to poor teaching skills. Poor language usage certainly limits the ability of students to communicate what they know about science and mathematics, and it is a handicap to social

advancement. On the other hand, poor teaching is an even greater handicap. Its effects on the individual can be long-lasting, and its consequences for the nation can be disastrous.

Recommendations for Improvement

In the light of these many difficulties with Eleanor Orr's data and her conclusions, and in view of my own findings as a teacher of mathematics, I make the following recommendations for improving the achievement of African Americans in mathematics, which apply equally well to science:

- Mathematics should be taught, beginning in preschool, in a manner that ties language usage and expression to the explanation and understanding of mathematical terms and concepts. This means that in addition to teaching children how to perform computations, we should also provide them with opportunities on a regular basis to give verbal and/or written explanations of what they are doing.
- As students learn to read, allow them to solve written problems in mathematics, and make reading instruction an integral part of teaching mathematics, especially in the early grades;
- Written instructional materials in mathematics for the early grades should be presented so that they combine mathematical concepts and logical reasoning with the enhancement of language skills.
- Schools should treat students who happen to speak in so-called "Black English" in the same manner they treat all other students. Teacher expectations for these students should not be lowered.

Every effort should be made to move African-American students, as well as all other students, toward precise language usage for an understanding of mathematical concepts and problem solving. We should not focus on "Black English" of students and label it as a deficiency. Rather, we should focus on whether we have extended ourselves fully as teachers, combining sensitivity toward our students with the broadest spectrum of available communication tools and our own understanding of correct mathematical and scientific principles.

Essays and Policy Studies on Education

This is one of several of essays and policy studies intended for policymakers, researchers, teachers, administrators, parents, students and others who are interested in the education of African-American, Hispanic-American, American-Indian and Asian-American youth. The entire series of essays and policy studies explores the cultural roots and historical legacies of these various groups. It probes what it means to be independent and to enjoy that liberty. It discusses the general context of learning in schools of all types, and it lays the foundation for determining what must be done to enhance American education. It is also designed to stimulate readers to consider why independent schools are important and what role they should have in America's educational system.

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